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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,678	09/30/2004	Chang-Hu Tsai	13605-US-PA	5677

31561 7590 02/23/2007  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER

GHYKA, ALEXANDER G

ART UNIT	PAPER NUMBER
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2812

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

# Office Action Summary

Application No.

10/711,678

Applicant(s)

TSAI ET AL.

Examiner

Alexander G. Ghyska

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5-11 and 13-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-3, 5-11 and 13-22 are subject to restriction and/or election requirement.

ALEXANDER GHYKA  
PRIMARY EXAMINER

AV 2812  
*Alex Ghyska*

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

### **DETAILED ACTION**

Applicants' RCE of 12/22/2006 has been entered in the record. Claims 1-3, 5-11 and 13-22 are now under consideration. With respect to the rejection of the Claims under 35 USC 103, as being unpatentable over Nishizawa in view of Autryve, Applicants' arguments have been considered, but they are not persuasive for the reasons as discussed below. The following new Claim objection is made.

#### ***Claim Objections***

Claim 21 is objected to because of the following informalities: Line 2 contains the letter "p" by itself. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

**Claims 1-3, 5-11 and 13-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishizawa (US 6,613,686) in view of Autryve (US 5,935,877).**

Referring to Figures 1A-1F and related text, Nishizawa discloses (Re Claims 1-2 and 20) a patterning method, comprising: providing a substrate having a film formed over thereon (see col. 4, line 59 - col. 5, line 25); patterning a photoresist layer (see col. 7, lines 45-48), which would require the steps of forming a photoresist layer over the film; exposing and developing the photoresist layers; and etching the film using the patterned photoresist layer as an etching mask at a temperature range of about -50 to about 50 degrees Celcius, wherein the temperature range is between about -30

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degrees Celcius and about 30 degrees Celcius (see column 7, lines 49-55). Moreover, Nishizawa discloses an anisotropic etching process.

Nishizawa does not disclose wherein a power is applied at one electrode from an external plasma source for generating the electric field, is in the range of about 150 W to about 300 W.

Autryve also discloses a plasma etch process. The missing limitations are well known in the art because Autryve discloses these features (see column 6, lines 43-53 and column 7, lines 12-39).

It would have been obvious for one of ordinary skill in the art, at the time of the invention, to use the power ranges of Autryve, in the process of Nishizawa, for its known benefit in plasma etching processes. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. See *In re Wertheim*, 541 F. 2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F. 2d 1575, 16 USPQ 2d 1934 (Fed. Cir. 1990).

Re Claim 3, Nishizawa does not disclose expressly wherein the temperature range is controlled via a susceptor positioned below the substrate. However, the Examiner maintains that it would be obvious for one of ordinary skill in the art to control, the temperature of the etch, especially as Nishizawa discloses overlapping temperature ranges.

Re Claim 5, Nishizawa also discloses wherein the etching process comprises an anisotropic plasma etching process which is performed by directing an ionized plasma via a field; Re Claims 6 and 22, wherein the ionized plasma is performed by ionizing a

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plasma source selected from a group consisting of helium (He), neon (Ne), argon (Ar), krypton (Kr) and xenon (Xe); Re Claim 7, wherein a flow rate of the ionized plasma is in a range of about 20 to about 200 sccm. See column 6, lines 8-32 and Tables 1-2.

Re Claims 8-9 and 21, wherein the external plasma source comprises  $\text{CF}_4:\text{CHF}_3$ ,  $\text{CF}_4:\text{CH}_2\text{F}_2$ ,  $\text{C}_2\text{F}_6:\text{CHF}_3$  or  $\text{C}_2\text{F}_6:\text{CH}_2\text{F}_2$ , at a ratio greater than 1. See column 5, lines 31-37 and Table 1. Re Claim 10, wherein a gas flow ratio  $\text{CF}_4$  to  $\text{CHF}_3$  of the  $\text{CF}_4:\text{CHF}_3$ , a gas flow ratio of  $\text{CF}_4$  to  $\text{CH}_2\text{F}_2$  of the  $\text{CF}_4:\text{CH}_2\text{F}_2$ , a gas flow ratio of  $\text{C}_2\text{F}_6$  to  $\text{CHF}_3$  of the  $\text{C}_2\text{F}_6:\text{CHF}_3$  or gas flow ratio of  $\text{C}_2\text{F}_6$  to  $\text{CHF}_3$  of the  $\text{C}_2\text{F}_6:\text{CHF}_3$  is larger than 1.

Re Claim 13, Nishizawa does not disclose expressly wherein a thickness of the patterned photoresist layer is in a range of about 200 nm to about 500 nm; and re Claim 14, wherein the photoresist layer comprises a positive photoresist layer or a negative photoresist layer. However any variation in resist thickness in the present claims is obvious in light of the cited art, because the changes in thickness produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the art. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. In re Aller 105 USPQ 233, 235. In re Reese 129 USPQ 402, 406. Both positive and negative resist are well known in the art, the use of either one depends of the flow of the process and the feature to be etched.

Re Claims 15-18, Nishizawa also discloses wherein the film comprises a single layer or multiple layers: wherein the film comprises a dielectric layer, an inter-metal

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dielectric (IMD) layer or an inter-layer dielectric layer; wherein the film comprises an oxide layer, a nitride layer, a poly-silicon layer or a single crystal silicon layer; wherein the patterning method is performed to form a trench structure, a contact structure or a via structure in the film (see Figure 1A). Re Claim 19, Nishizawa fails to expressly disclose wherein the trench structure comprises a shallow trench isolation structure (STI) structure. However, this would have been obvious to one of ordinary skill in the art, to use the same process to form a STI when an isolation feature is formed instead of a contact.

### ***Response to Applicants' Arguments***

Applicants respectfully assert that Nishizawa in view of Autryve is legally deficient for the purpose of rendering claims 1 and 20 unpatentable for at least the reason that not every element of the Claim was taught or suggested by cited references and that the invention as a whole would not have been obvious to one of ordinary skill in the art. Applicants argue that the present invention claims "a power applied at one electrode in a range of about 150 W to about 300 W". In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). With respect to the limitation "containing a perfluorinated chemical and a partially fluorinated chemical supplied at a flow rate of

larger than one", as taught by Claim 20, the Examiner maintains that a reference is not limited to its preferred embodiments. See *In re Boe*, 148 USPQ 507. (CCPA 1966).

Applicants argue that the technical significance of the foregoing limitations is that the anisotropic plasma etching process includes a power applied at one electrode in a range of about 150 W to about 300 W for generating a field, and the power brings high bombardment ions and thereby the condense defect at low temperatures and the iso-dense loading defect is improved. In response to applicant's argument that there is no suggestion to combine the references, the Examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Examiner maintains that as both references pertain to plasma etching, the selection of the power range and gas flow ratio would be simply a matter of optimization. In response to applicant's argument that the condense defect problem is solved, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Applicants argue that according to their experiment the range of the power level of the plasma is very important for the etching process to reduce the condense defect.

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The Examiner agrees that that overlapping ranges of the prior art is unobvious if that particular range is critical. The Examiner agrees that there is some showing of criticality in the range of *less than 300 W*. The Examiner notes little difference between 300 and 350 W in the results submitted. However, the Examiner maintains that the "objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support". See *In re Clemens*, 622 F. 2d 1029, 1036 USPQ 289, 296 (CCPA 1980). In the present case there is no disclosure of the reactants and the reaction conditions which are used to show criticality. Any new unobvious results submitted, must clearly identify the reaction conditions, and if not in the Specification as originally filed, must be submitted in the form of a Rule 132 declaration.

With respect to Applicants discussion of the gas flow ratio of greater than one of perfluorinated chemical to partially fluorinated chemical, the Examiner notes that there is no disclosure of the ratio or reactants used in the results submitted. As discussed above, the Examiner maintains that a reference is not limited to its preferred embodiments. See *In re Boe*, 148 USPQ 507. (CCPA 1966). Just because a composition is unpreferred in the prior art, does not mean it is patentably distinguished. Moreover, it is well within the skill of one of ordinary skill in the art to optimize the ratio of the claimed reactants. The discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. See *In re Antonie*, 195 USPQ 6 (CCPA 1977); *In re Aller* 105 USPQ 233 (1955). Moreover, with respect to the limitation "using plasma sources containing a perfluorinated chemical and a partially fluorinated chemical supplied at a gas flow ratio of larger than 1", the Examiner



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maintains that the ratio is disclosed in column 5, lines 31-37 and Table 1 of the Autryve (US 5935877) reference. Furthermore, the ratio of 3:7 to 0:1 as disclosed by the prior art, encompasses the presently claimed ratio. The Examiner maintains, as discussed above, that overlapping ranges are *prima facie* obvious, in the absence of unobvious results. See *In re Wertheim*, 541 F. 2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F. 2d 1575, 16 USPQ 2d 1934 (Fed. Cir. 1990). In the present case there is no showing of unobvious results commensurate with the claim language, or an identification of the reactants or reaction conditions which are tested. Therefore, the *prima facie* case of obviousness is maintained.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander G. Ghyka whose telephone number is (571) 272-1669. The examiner can normally be reached on Monday through Friday during general business hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AGG  
February 8, 2007

ALEXANDER GHYKA  
PRIMARY EXAMINER

AU 2812  
*Alex Ghysa*